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(54) **HEIGHT-ADJUSTABLE SUPPORTING DEVICE FOR AN ELECTRIC HOUSEHOLD OR REFRIGERATOR SHELF**

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See application file for complete search history.

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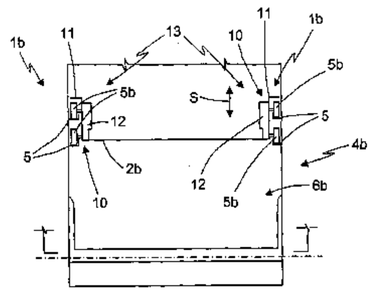
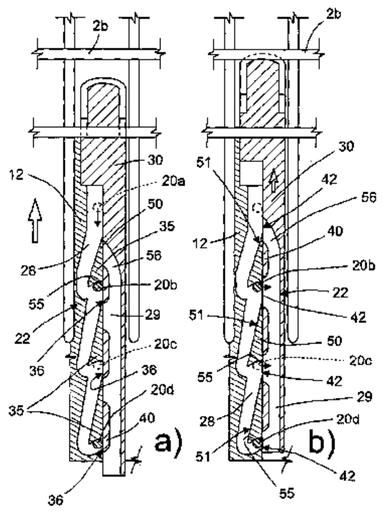
(57) **ABSTRACT**

A supporting device for an inner supporting member of an electric household appliance, which includes a support securable, in use, by a first part thereof to a fixed guide and a second part facing the first, to a side edge of the inner supporting member. Both parts are relatively movable in a sliding direction perpendicular to the supporting member. Further included is a releasable retaining means for blocking the second part in different positions.

10 Claims, 3 Drawing Sheets





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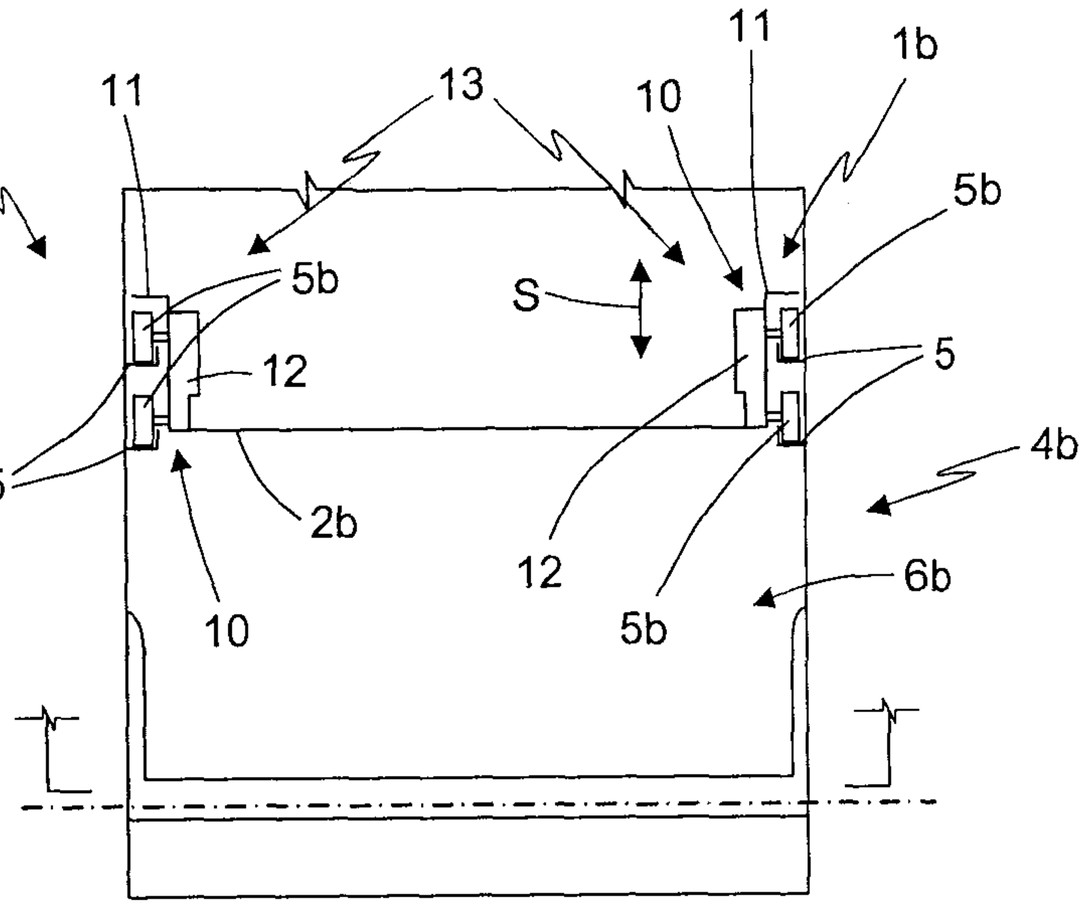
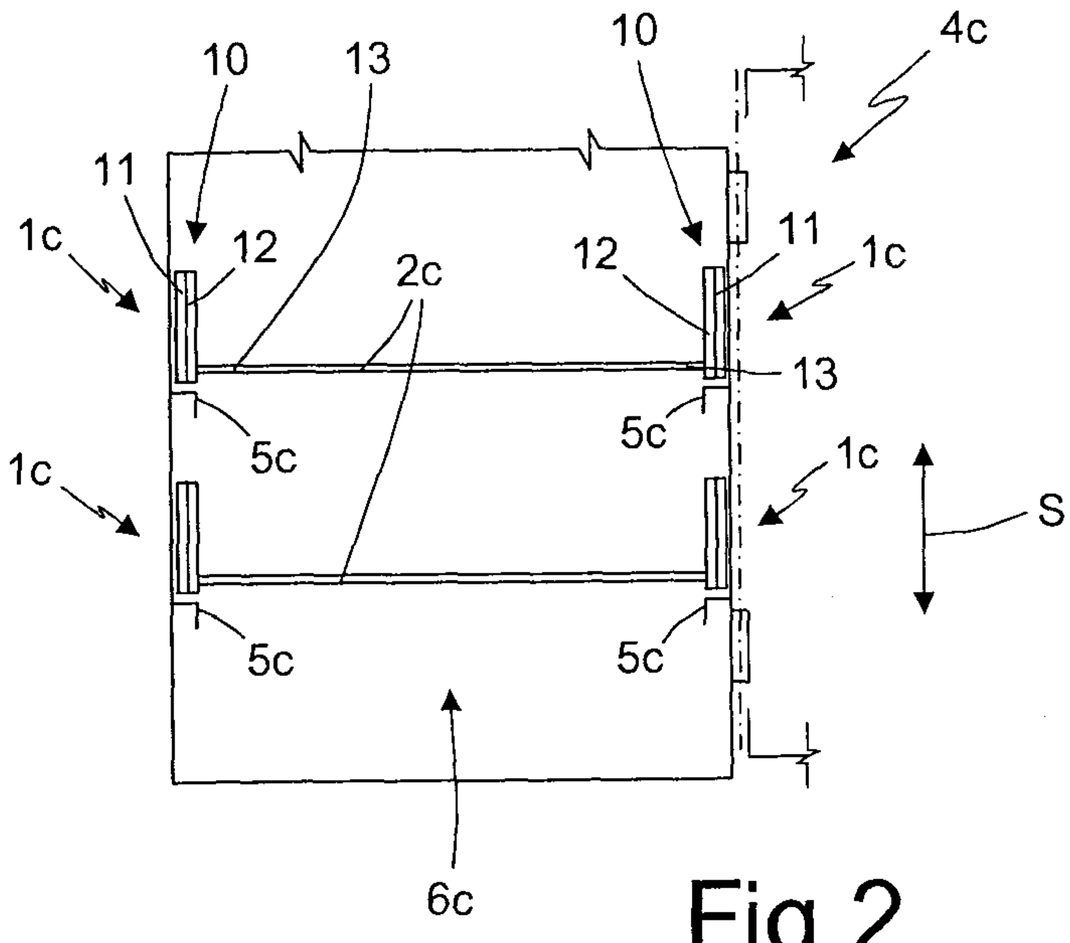

1b
11
13
10
11
1b
5b
S
5b
12
5
5
4b
2b
12
6b
10
5b

Fig.1


10
13
10
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11
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13
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5c
1c
1c
S
5c
5c
6c

Fig.2

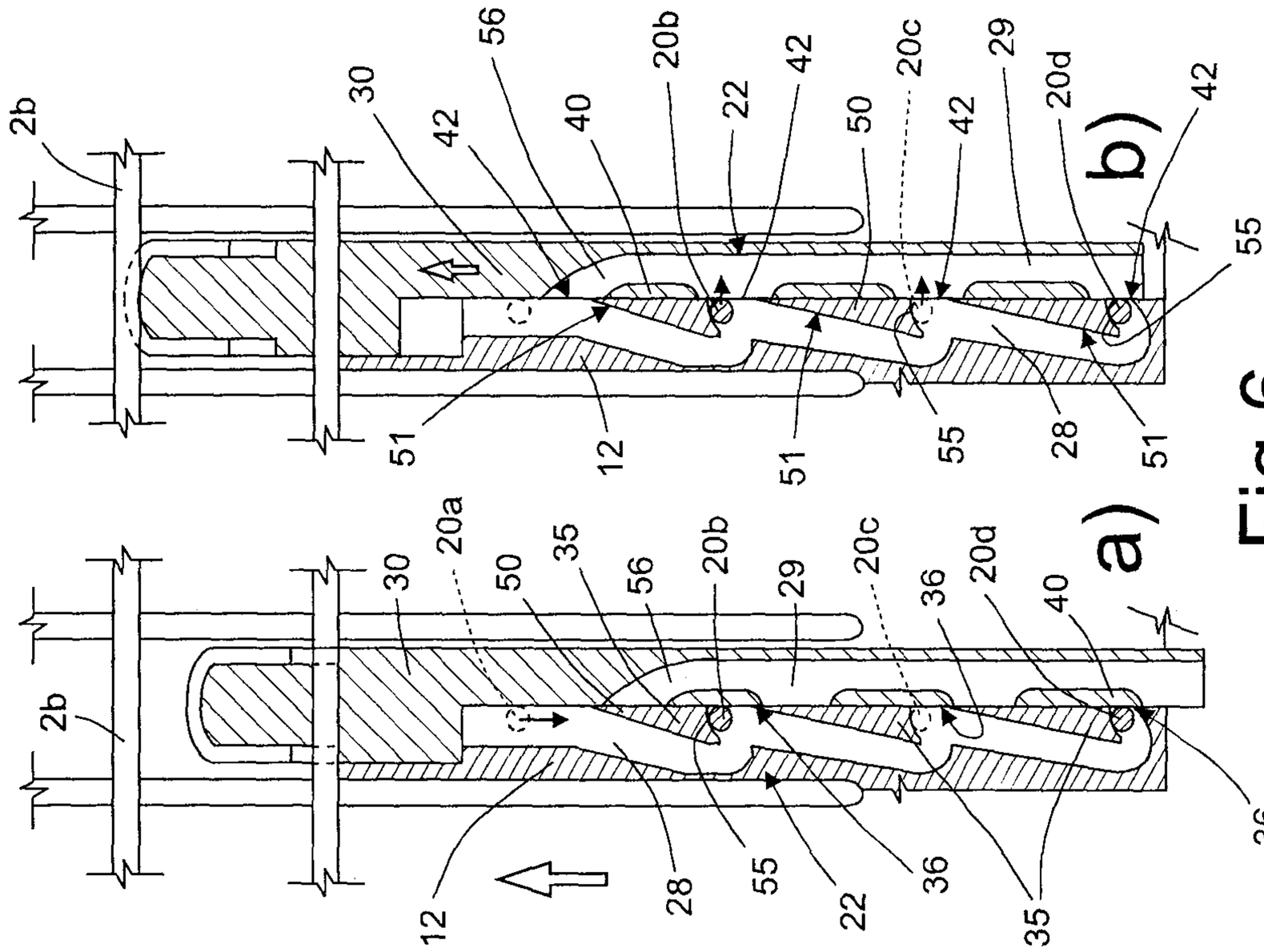
2b
30
42
56
40
20b
22
42
50
20c
42
29
20d
42
55
b)
51
12
51
55
28
51
2b
30
20a
50
35
56
20b
29
20c
36
20d
40
a)
36
12
28
55
22
36
35

Fig.6

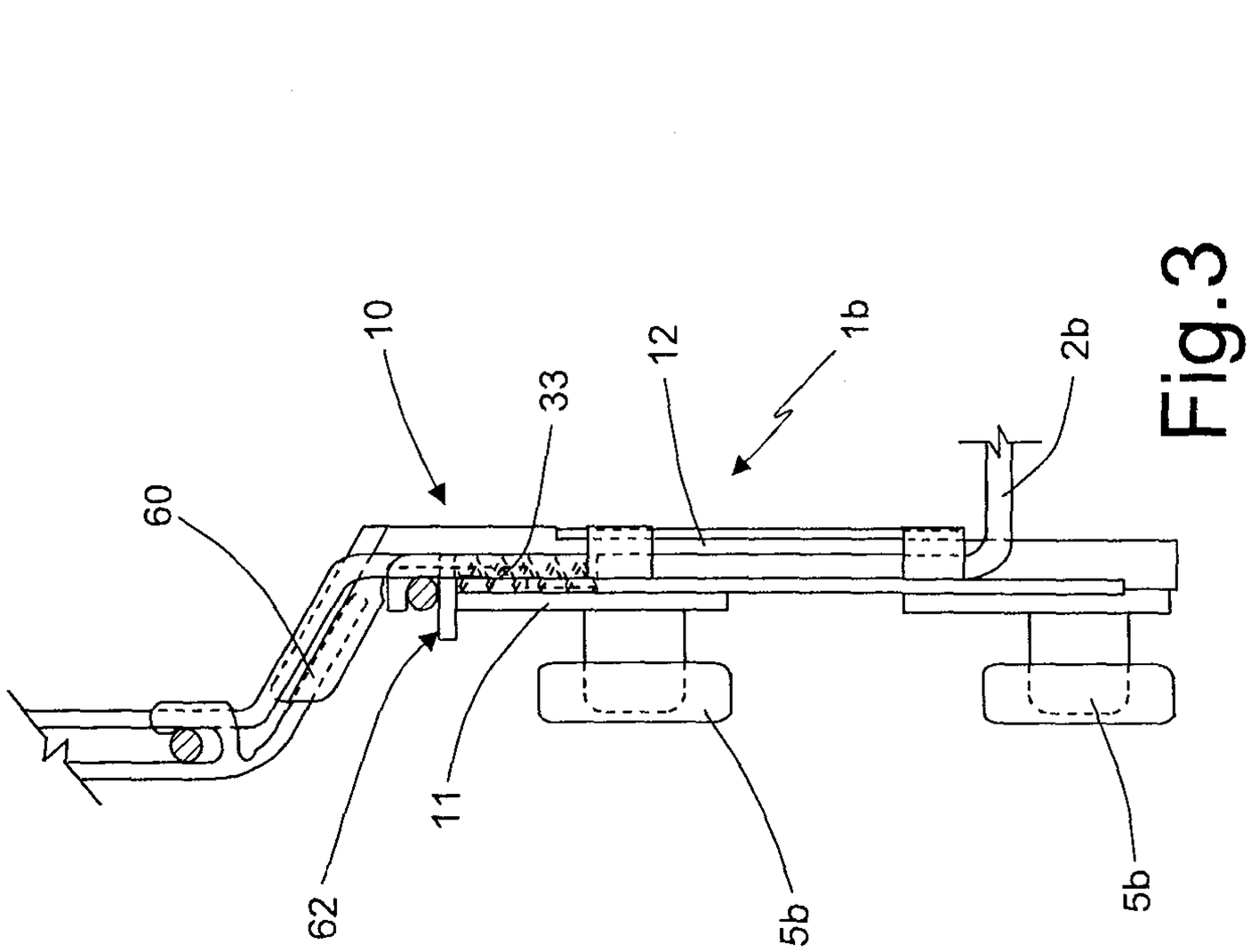
10
33
12
1b
2b
60
11
62
5b
5b

Fig. 3

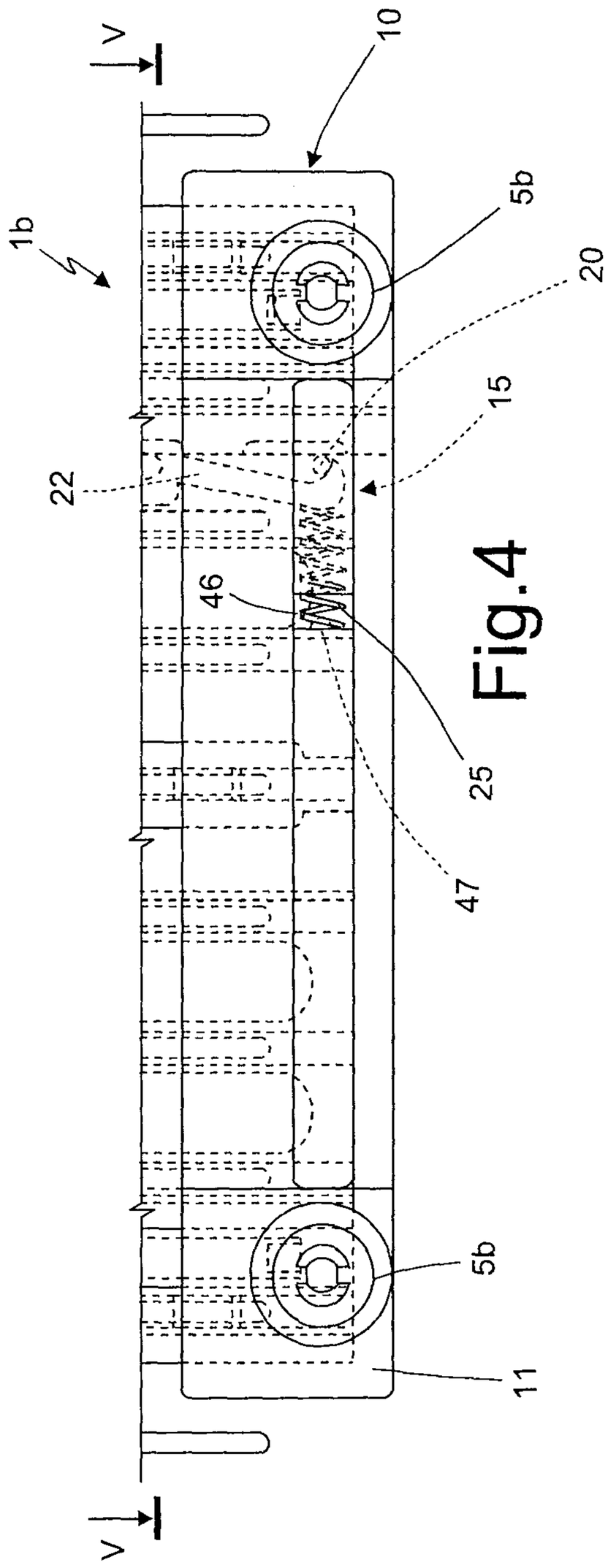
V
10
1b
5b
20
15
22
46
25
47
5b
11
V

Fig.4

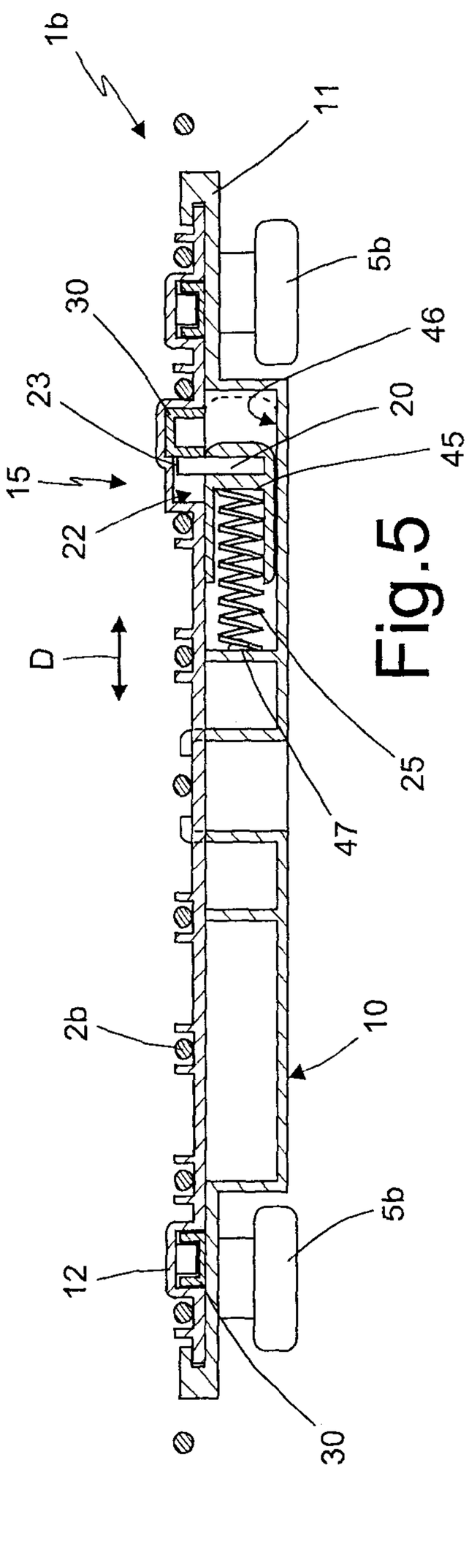
1b
11
5b
30
46
23
20
45
15
22
D
25
47
2b
10
12
5b
30

Fig.5

HEIGHT-ADJUSTABLE SUPPORTING DEVICE FOR AN ELECTRIC HOUSEHOLD OR REFRIGERATOR SHELF

RELATED APPLICATIONS

The present application is national phase of International Application Number PCT/IB2009/052302 filed Jun. 1, 2009, and claims priority from, Italian Application Number TO2008A000436, filed Jun. 6, 2008.

TECHNICAL FIELD

The present invention relates to a height-adjustable supporting device for an electric household appliance inner supporting member, such as a dishwasher rack or an inner supporting shelf of a refrigerator or freezer.

BACKGROUND ART

The problem of allowing users to adjust the height of the upper extractable rack within the washing compartment of the machine, e.g. to be able to allow dishes of different height to be inserted (e.g. plates of different diameter or tumblers and wine glasses) into the dishwasher rack, thus always optimizing the available space, is particularly felt in the dishwasher industry. For example, an adjustment device is known from EP0033483; it is based on side supporting members for the rack, normally engaging the fixed guides of the dishwasher, provided with two upper and lower parts reciprocally and vertically sliding, which may be fixed at different heights by means of disconnectable blocking portions thereof.

Such a device however has relatively complex structure and operation, and may thus cause jamming; furthermore, it is in any case costly, large in size and relatively complex to be used by the user. Moreover, the above-described device is not adapted to be used in other applications, e.g. for adjusting the position of the inner supporting shelves of a refrigerator or freezer in height, where today the need to allow the user to make this adjustment in a simple and rapid manner and with small volumes, is also very felt, in order to allow, even in this case, the stowage of food of different size into the inner volume of the electric household appliance to be optimized.

DISCLOSURE OF INVENTION

It is thus an object of the present invention to provide a height-adjustable supporting device for an electric household appliance inner supporting member designed to eliminate the above-mentioned drawbacks and, in particular, to display low production cost, reduced dimensions (in particular, transversally to the fixed supporting guides present in the electric household appliance), a high use and assembly easiness, and an absolute operation reliability.

Furthermore, it is an object of the invention to achieve these results along with the possibility of being able to change the position in height of the supporting member within the electric household appliance, not only between two different positions, as most of the known devices, but between a plurality (three or more) different positions.

According to the present invention, a height-adjustable supporting device for an electric household appliance inner supporting member, such as, for example, a dishwasher rack or an inner supporting shelf of a refrigerator or freezer, is thus provided as set forth in claim **1**.

In particular, the supporting device of the invention comprises a support securable, in use, by means of a first part thereof to a fixed guide, e.g. present in an inner compartment, such as the washing compartment of a dishwasher or the refrigerated compartment of a refrigerator or freezer, and by means of a second part thereof, opposite to and facing the first, to a side edge of the inner supporting member of the electric household appliance.

The second part of the support is movably carried by the first part in a relative sliding direction therebetween, which direction is perpendicular to a laying plane of the inner supporting member; the device further comprises releasable retaining means or a releasable retaining element for blocking the second part with respect to the first in a plurality of different positions along the relative sliding direction.

According to an aspect of the invention, the releasable retaining means comprise: a pin carried by the first part of the support overhangingly protruding towards the second part of the support in a direction which is transversal, in use, to the fixed guide, the pin being further sliding on the first part of the support against the bias of first elastic means in a direction which is parallel, in use, to the fixed guide; and a desmodromic sliding track for a free end of the pin, the track being divided into a first and a second branch integrally obtained, respectively, within the second part of the support and within a slide slidingly carried, against the bias of second elastic means or a second elastic member, by the second part of the support in the relative sliding direction between the latter and the first part.

Hereinafter, "desmodromic track" means a sliding track which is shaped so as to present two branches interconnected in a closed path and which may be selectively engaged by a movable member, in the above-described case the pin, so that the track may be covered as a whole by the movable member by means of a transversal displacement of the movable member which determines the transfer thereof from one track branch to the other.

According to the invention, the first branch is provided with a plurality of resting teeth for the pin, which are arranged in sequence along said sliding direction and aligned with an equal number of first openings facing the second branch and the latter is separated from the first by a wall of the slide, which wall displays in turn a plurality of second openings for the pin, facing the first branch and held by the second elastic means in an offset position from the first openings in the relative sliding direction.

Furthermore, the first elastic means are mounted so as to be preloaded to push the pin, transversally to its own axis, against the wall of the slide which separates the second branch of the desmodromic track from the first branch.

According to a further aspect of the invention, the first openings are laterally and thoroughly obtained through a longitudinal ridge integrally carried by the second part of the support and parallelly aligned to the relative sliding direction, so as to separate the first track branch from the second, which is integrally provided towards the first branch of the track with the aforesaid resting teeth, which are saw-tooth-shaped in the relative sliding direction.

Furthermore, the resting teeth define an equivalent number of supporting shoulders for the free end of the pin along said relative sliding direction, by means of which the first part of the support bears in use the second part through the pin. In order to ensure the correct operation of the whole, the second branch of the desmodromic track is longer than the longitudinal ridge of the second part of the support and ends, on the side opposite to the shoulders, with a curved end facing the first branch and aligned with one of said second openings.

Finally, the second elastic means consist in a spring mounted so as to be preloaded and sandwiched between the

slide and the second part of the support in the relative sliding direction, so as to allow, in use, a relative movement between the slide and the second part of the support against the bias of the spring, in order to produce the alignment between the first and second openings so as to interconnect the first and second branches of the desmodromic track, both in correspondence with the teeth and in correspondence with the curved end of the second branch, thus allowing the pin to selectively engage the first and second branches of the desmodromic track.

Thereby, a supporting device is obtained having a highly effective, compact selective blocking mechanism between the reciprocally movable parts, which may be implemented so as to allow to have two, three or more (or "n", where "n" is an integer as desired) different adjustment positions, the mechanism which may be simply actuated by manually imparting a push to the shelve or rack to be moved, generally upwards. Furthermore, the so obtained supporting device as a whole has small dimensions, in particular transversally to the guides, is absolutely reliable, simple and cost-effective to be implemented and easy to be used, and may possibly be also provided with a handle control for manually producing the relative translation between the slide and the second part of the support.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features and advantages of the present invention will be apparent from the following description of a preferred embodiment thereof, merely provided by way of non-limitative example, with reference to the accompanying drawings, in which:

FIGS. **1** and **2** diagrammatically show two possible applications of the supporting device according to the invention;

FIG. **3** shows a front elevation view on enlarged scale of a part of the supporting device of the invention applied to the electric household appliance in FIG. **1**;

FIGS. **4** and **5** are a longitudinal elevation view and a section view, respectively, along a plotting plane V-V of the supporting device in FIG. **3** applied to an inner supporting member, in this case a rack, of the electric household appliance in FIG. **1**; and

FIGS. **6***a*) and **6***b*) show some constructional details of the supporting device of the invention on enlarged scale and partially in section on the plane in FIG. **4**.

BEST MODE FOR CARRYING OUT THE INVENTION

With reference to figures from **1** to **6**, numerals **1***b*,**1***c* indicate a supporting device for an inner supporting member **2***b*,**2***c* of an electric household appliance **4***b*,**4***c*. In the non-limitative case shown, the inner member **2***b* is an upper rack of a dishwasher **4***b*, mounted in an extractable manner, by means of rollers **5***b*, along fixed guides **5** in an inner compartment **6***b*, in this case a washing compartment, of the electric household appliance **4***b*; or it is an inner supporting shelf **2***c* of a refrigerator or freezer **4***c*, mounted on fixed guides **5***c* in a refrigerated compartment **6***c*. In figures from **3** to **6**, the device of the invention is described and illustrated with reference to the device **1***b* applied to a rack **2***b* of a dishwasher **4***b*.

It is however apparent that the description identically also applies to the device **1***c*, both the devices **1***b* and **1***c* comprising a support **10** securable in use by means of a first part **11** thereof to a fixed guide **5***b*,**5***c* and by means of a second part **12** thereof, opposite to and facing the first, to a side edge **13** of the inner element **2***b*,**2***c*, the second part **12** of the support **10** being movably carried by the first part **11** in a relative sliding direction S therebetween, which direction is perpendicular to the laying plane of the inner supporting member **2***b*,**2***c* concerned at the time. The only difference between the devices **1***b* and **1***c* is that the part **11** directly engages the guides **5***c* in the device **1***c*, while, in the device **1***b*, it engages the guides **5** by means of the rollers **5***b*, in a known manner, so as to allow the rack **2***b* to be extracted from the washing compartment **6***b*.

With reference hereinafter to figures from **3** to **6** only, the device **1***b* of the invention (i.e. also **1***c*) further comprises releasable retaining means **15** (FIGS. **4**, **5**) for blocking the second part **12** with respect to the first part **11** in a plurality of different positions along the relative sliding direction S, which retaining means **15** comprise a pin **20** carried by the part **11** of the support **10** overhangingly protruding towards the second part **12** in a transversal direction to the fixed guide **5**, in use, and a desmodromic sliding track **22** for a free end **23** (i.e. the protruding end) of the pin **20**.

The pin **20** is further carried so as to slide on the first part **11** of the support **10** against the bias of first elastic means **25** in a direction D which is parallel, in use, to the fixed guide **5** and thus perpendicular to the sliding direction S and parallel to the laying plane of the rack **2***b*, while the track **22** is divided into a first branch **28** and a second branch **29** (FIG. **6**) integrally obtained, respectively, within the second part **12** of the support **10** and, according to the invention, within a slide **30**; in particular, the branches **28** and **29** are integrally obtained in one piece with the part **12** and with the slide **30**, respectively.

The slide **30** is in turn carried by the second part **12** of the support **10** so as to slide against the bias of second elastic means **33** (FIG. **3**) in the relative sliding direction S between the latter and the first part **11**, in this case sandwiched between the parts **11** and **12** (FIG. **5**).

The first branch **28** is provided with a plurality of resting teeth **35** for the pin **20**, arranged in sequence along the sliding direction S and aligned with an equivalent number of first openings **36** facing the second branch **29** and the latter is separated from the first branch by a wall **40** of the slide **30**, displaying a plurality of second openings **42** for the pin **20** facing the first branch **28** and held, by the second elastic means **33**, normally offset from the first openings **36** in the relative sliding direction S, i.e. in the position shown in FIG. **6***a*.

In this case, the first elastic means **25** are mounted so as to be preloaded in their seat on the part **11** of the support **10** and push the pin **20**, transversally to its axis, against the wall **40** of the slide **30** which separates the second branch **29** of the desmodromic track **22** from the first branch **28**. In particular, the pin **20** is integrally carried by a cursor **45**, in which it is transversally and protrudingly driven on a side thereof facing the second part **12** of the support **10**; the cursor **45** is, in turn, mounted so as to slide within a guide **46** obtained on the first part **11** of the support **10** facing the second part **12** and from which the free end **23** of the pin **20** overhangingly protrudes within the desmodromic track **22**. As shown in FIGS. **4** and **5**, the first elastic means consist in a helical spring **25** sandwiched between the cursor **45** and a closed bottom end **47** of the guide **46**, which therefore acts also as a housing seat for the spring **25**.

In the example shown, the first openings **36** are laterally obtained through a longitudinal ridge **50** integrally carried in one piece by the second part **12** of the support **10** and parallelly aligned to the relative sliding direction S, so as to separate the first branch **28** of the track **22** from the second branch **29** along with the wall **40**, with respect to which it is thus parallelly aligned and cooperates in contact.

The ridge **50** overhangingly projects toward the first part **11** of the support **10** and is integrally provided, towards the first

branch **28** of the track **22**, with the teeth **35** which are saw-tooth-shaped in the relative sliding direction S. In combination, the first branch **28** of the track **22** is shaped in a conjugated manner with the shape of the resting teeth **35**, so that every relative sliding between the first part **11** and the second part **12** of the support **10** produces a thrust on the pin **20** by means of respective inclined planes **51** of the teeth **35** (FIG. **6***b*), so as to displace the pin against the bias of the elastic means **25**, transversally to the longitudinal ridge **50** and to the second wall **40** of the slide **30**, which slidingly cooperates against the longitudinal ridge **50**, on the part opposite to the branch **28** and thus on the side of the ridge **50** opposite to the one provided with the teeth **35**.

The teeth **35** are shaped so as to define an equivalent number of supporting shoulders **55** for the free end **23** of the pin **20** along the relative sliding direction S, by means of which the first part **11** of the support **10** bears in use the second part **12** by means of the pin **20** itself; furthermore, according to a further feature of the invention, the second branch **29** of the desmodromic track **22** is longer than the longitudinal ridge **50** and ends on the side opposite to the shoulders **55**, with a curved end **56** facing the first branch **28** and aligned with an opening **42**.

In the case shown, the second elastic means **33** consist of a spring mounted so as to be preloaded and sandwiched between the slide **30** and the second part **12** of the support **10** in the relative sliding direction S, so as to allow, in use and against the bias of the spring **33**, a relative movement between the slide **30** and the second part **12** of the support **10** in the direction of the arrow (FIG. **6**) in order to produce the alignment between the first openings **36** and the second openings **42** (FIG. **6***b*) so as to interconnect the first branch **28** and the second branch **29** of the desmodromic track **22** in a selective manner only; in any case, the selective connection simultaneously occurring both at all the teeth **35** and at the curved end **56** of the second branch **29**, thus allowing the pin **20** to selectively engage the first branch **28** and the second branch **29** of the desmodromic track **22** according to the relative position between the slide **30** and the part **12** of the support **10**.

The slide **30** is preferably provided with a handle **60** adapted to allow a user to manually produce, in use, the relative movement between the slide **30** and the part **12** of the support **10**. In any case, the first part **11** and second part **12** of the support **10** are made so as to selectively take, in use, along the relative sliding direction S, a stroke end position in which the first part **11** directly supports the second part **12** by means of a shoulder **62** thereof (FIG. **3**), and in which the pin **20** engages the first branch **28** of the desmodromic track **22** without engaging any resting tooth **35**, i.e. it is in the position shown with a dashed line in FIG. **6***a* and indicated by numeral **20***a*. The other positions which may be selectively taken by the pin **20** on the track **22** along the branch **28** are diagrammatically shown in FIG. **6**, partially with a dashed line, partially with a solid line and in bold print, and are indicated with numerals **20***b*, **20***c*, **20***d*, respectively.

In use, by virtue of the described supporting device, the rack **2***b* may selectively take a first position, in this case the lowest position, when the part **12** rests in abutment against the shoulder **62** of part **11**, and other three gradually higher positions, as the pin **20** slides along the branch **28** to selectively engage, in sequence, the teeth **35** one after the other, it being sufficient to simply exert an upward push on the rack **2***b* to obtain such a movement.

In order to return the rack **2***b* to the starting position (the lowest position) it is sufficient, in any of the most raised positions, to make the slide **30** relatively slide with respect to the part **12** of the support **10**, e.g. by directly acting on the handle **60**, or by producing, in the stroke end position **20***d*, a further upward push of the rack **2***b*; this indeed produces the instantaneous alignment of all the openings **36** with all the openings **42**, thus allowing the spring **25** to force the pin **20** to pass into the branch **29**, where it then slides upwards due to the gravity (to the weight of the rack **2***b*) at the end being returned to the branch **28** by the curved end **56**, approximately close to the downward stroke end position of the rack **2***b*.

The invention claimed is:

1. A supporting device for an inner supporting member of an electric household appliance, said supporting device comprising:

a support including

a first part securable in use to a fixed guide provided at an inner compartment of the electric household appliance, and

a second part, opposite to and facing the first part, securable in use to a side edge of the inner supporting member of the electric household appliance, the second part of the support being movably carried by the first part in a relative sliding direction, the second part adapted to be perpendicular to a laying plane of the inner supporting member; and

a releasable retaining element for blocking the second part with respect to the first in a plurality of different positions along said relative sliding direction,

wherein the releasable retaining element comprises:

a pin carried by the first part of the support and having a free end overhangingly protruding towards the second part of the support in a transverse direction perpendicular to the relative sliding direction;

a first elastic member, the pin being slidable on the first part of the support against bias of the first elastic member in the transverse direction;

a second elastic member; and

a desmodromic sliding track along which the free end of the pin is movable, and the track including a slide that is slidingly carried against bias of the second elastic member by the second part of the support in the relative sliding direction between the second part and the first part of the support, the track being divided into a first and a second branches, integrally formed, respectively, within the second part of the support and within the slide,

wherein

the first branch of the track includes a plurality of first openings facing the second branch and a plurality of resting teeth for the pin, which are arranged in sequence along said relative sliding direction and aligned with an equal number of the first openings facing the second branch, and

the second branch of the track is separated from the first branch by a wall of the slide having a plurality of second openings for the pin which are facing the first branch and are held by the second elastic member in an offset position from the first openings in the relative sliding direction.

2. A device according to claim **1**, wherein said first elastic member is preloaded and pushes said pin, in the relative sliding direction, against said wall of the slide which separates the second branch of the desmodromic sliding track from the first branch.

3. A device according to claim **2**, wherein

said pin is integrally carried by a cursor and said pin is transversally and protrudingly fitted on a side of the cursor facing the second part of the support,

the cursor is slidingly mounted within a guide of the first part of the support facing the second part, and

the free end of the pin overhangingly protrudes from the guide and within said desmodromic sliding track.

4. A device according to claim **3**, wherein said first elastic member comprises a helical spring sandwiched between said cursor and a closed end of said guide.

5. A device according to claim **1**, wherein

the second part of the support further comprises a longitudinal ridge extending in the relative sliding direction,

said first openings are formed through the longitudinal ridge in the transverse direction and are aligned with each other along the relative sliding direction,

said ridge separates the first branch of the track from the second branch of the track, protrudingly projects towards the first part of the support, and is integrally provided with said resting teeth which are saw-tooth-shaped, and

said resting teeth project toward the first branch of the track.

6. A device according to claim **5**, wherein

said first branch of the track is shaped in a conjugated manner with said resting teeth, so that a relative sliding between the first and the second parts of the support produces, by corresponding inclined planes of said teeth, a thrust on the pin so as to displace the pin against the bias of the first elastic member, transversally to said longitudinal ridge of the second part of the support and to said wall of the slide,

the wall of the slide slidingly cooperates against said longitudinal ridge.

7. A device according to claim **5**, wherein

said teeth define along said relative sliding direction an equivalent number of supporting shoulders for supporting the free end of the pin,

the second branch of the desmodromic sliding track is longer than said longitudinal ridge of the second part of the support and is located opposite to said shoulders, and

said second branch has a curved end facing the first branch and aligned with one of said second openings.

8. A device according to claim **1**, wherein said second elastic member comprises a spring preloaded and sandwiched between the slide and the second part of the support in said relative sliding direction, so as to allow a relative movement between the slide and the second part of the support against the bias of the spring, in order to produce the alignment between the first and the second openings so as to connect together the first and the second branches of the desmodromic sliding track to allow the pin to selectively engage the first and the second branches of the desmodromic sliding track.

9. A device according to claim **8**, wherein said slide is provided with a handle adapted to allow a user to manually produce, in use, said relative movement between the slide and the second part of the support.

10. A device according to claim **1**, wherein said first and second parts of the support are configured to selectively take, in use, along said relative sliding direction, a stroke end position in which the first part directly supports the second part by a shoulder thereof, and in which the pin engages the first branch of the desmodromic sliding track without engaging said teeth.

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